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UL 10 1920

Ontario Department of Agriculture

ONTARIO AGRICULTURAL COLLEGE

CIRCULAR NO. 29

Disinfectants and Their Use
on the Farm and in the Home

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The main purpose of disinfection is to destroy disease germs and thus help to prevent the spread of infectious diseases which are caused by these germs. Tuberculosis, anthrax, black leg, contagious abortion, hog cholera and foot-and-mouth disease are some of the infectious diseases which are liable to affect stock and cause heavy financial losses through sickness and death of the affected animals. Some of these diseases, as anthrax, foot-and-mouth disease and hog cholera, are highly infectious and often rapidly fatal, and call for strict quarantine of the herds where they occur until the disease is wiped out. Others, as tuberculosis and contagious abortion are of a more chronic type, and whilst it is necessary to isolate the affected animals if the spread of the disease is to be stopped, yet the government regulations do not require quarantine of the premises where these diseases occur. In the control and eradication of any of these infectious diseases, however, it is always essential that effective disinfectants be used on the floors, walls, fittings, etc., of the stables in which the animals are or have been housed, because the discharges from the animals will contain large numbers of the germs or bacteria that cause these diseases. Hence the stables get contaminated and healthy stock are liable to contract the disease from the contaminated buildings and their contents.

As we frequently get requests for directions for disinfection of farm buildings, it has been decided to prepare a short bulletin dealing with the subject.

PREPARATION OF THE BUILDINGS FOR DISINFECTION.

Before applying any disinfectant to a building, the walls, floors, and fittings should be well scraped, and swept, and the refuse gathered up

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and burnt or saturated with disinfectant before it is removed. Sometimes it is necessary to scrub with hot soda water and soap the stalls and mangers, or those parts with which the animals come most intimately in contact, before applying the disinfectant.

DESCRIPTION AND PREPARATION OF VARIOUS DISINFECTANTS.

I. Milk of Lime.

This is one of the cheapest and most useful of disinfectants for farm buildings. In preparing it, quicklime must be used.

(*a*) The quicklime is first slaked by adding a pint and a half of water to each quart of lime, or by weight 60 parts of water to each 100 parts of lime. This gives hydrate of lime—a dry powder.

(*b*) To each quart of hydrate of lime is then added 4 quarts of water. This gives the milk of lime ready to apply.

Milk of lime must be freshly prepared and applied at once if it is to be an effective disinfectant. It may be kept one or two days if tightly corked up, but soon loses its value if exposed to the air. Air-slaked lime has no disinfectant power.

Milk of lime may be applied with a whitewash brush or with a sprayer. The sprayer does the best work. Before using a sprayer, however, it is necessary to pass the milk of lime through a fine sieve or strainer in order to prevent clogging of the nozzle, and to thoroughly wash the nozzle after use. Milk of lime leaves no strong or disagreeable odor in the building.

(Quicklime is most commonly used in the disposal of the carcasses of animals dead from an infectious disease. The carcass should be buried deeply and surrounded with twice its weight of unslaked lime before the soil is filled in.)

II. Chlorinated Lime. (Chloride of Lime, Bleaching Powder.)

Chlorinated lime is widely sold for deodorizing and disinfecting purposes. It is a white powder that gives off the pungent odor of chlorine. It should be kept in hermetically sealed containers, preferably glass sealers, as it loses its strength if exposed to the air. It is frequently put up for sale in cardboard boxes or tin cans. These are not satisfactory containers as the chlorine evaporates through the cardboard and the tin gets corroded and is soon perforated, thus allowing the strength of the powder to be rapidly lowered. When used, the powder should contain 33-35 per cent. available chlorine. We have tested many samples bought on the market and have found those put up in cardboard or tin to be frequently below 20 per cent., some being as low as 5 per cent. available chlorine.

Chlorinated lime may be used as a deodorant and disinfectant either in the powder form or in solution. Provided the powder is of full strength (33-35 per cent. available chlorine) a disinfectant solution may be prepared by adding 6 ounces of the powder to one gallon of water, first mixing with a little of the water to break up the lumps. This solution may be sprayed or brushed on the walls, floors, etc., same as described for milk of lime. Being of uncertain strength and somewhat destructive to metals, and having a permeating odor especially objectionable where milk or other foods are kept, chlorinated lime cannot be considered as the most desirable of stable disinfectants.

Disinfection of Drinking Water with Chlorinated Lime.

Its use in connection with the disinfection of drinking water, however, is very great. A large number of towns and cities in Europe, United States and Canada have their water supply treated with chlorinated lime to ensure against the dissemination of typhoid fever through contaminated water. It may be used to treat contaminated well or spring waters on the farm by preparing a stock solution as follows:—

1. Mix ½ lb. of chloride of lime (33-35 per cent. available chlorine) with 1 pint of water, stirring with a wooden spoon for about 15 minutes.

2. Add sufficient water to make 1 gallon.

3. [illegible] 13 ounces of washing soda in 2 quarts of luke warm water

4. Add sufficient water to make 1 gallon.

5. [illegible] the two solutions in a barrel or crock and allow the milky solution to settle over night (or filter). Pour off the clear liquid from the white sediment into a jug and fill into bottles, well stoppered, and keep in a cool, dark place for disinfecting purposes. This stock hypochlorite will contain approximately the equivalent of 3 per cent. of chloride of lime or 1 per cent. available chlorine.

Application.—One ounce of this stock solution to 5 gallons of drinking water, stir and allow to stand for half an hour. This treatment will destroy the contaminating bacteria present in the water and render it safe for drinking.

Chlorinated Lime Solution for Disinfecting Milking Machine Tubes and Teat-Cups. (Non-metallic.)

One lb. chloride of lime (full strength 33-35 per cent. available chlorine). Ten lbs. of water; mix in enamel pail or crock or wooden tub. Allow to stand 2 or 3 hours with an occasional stir. Allow to settle and pour or syphon off the clear liquid to which add water sufficient to make 100 lbs. Throw away the white sediment.

Immerse rubber tubes and teat cups in this solution. It will be good for about 2 weeks in summer and 3 weeks in winter. Tubes and cups should be well washed and rinsed before and after immersion in the solution.

Commercial Hypochlorite (Chlorinated Lime) Preparations.

During the last few years a number of commercial preparations in clear liquid form have been put on the market. These are known under a variety of names, as Liquid Chlorides, Hypozone, B.K., Germtox, etc. We have found these to be satisfactory disinfectants, but they come more expensive than making one's own chloride of lime solutions. They have the advantage, however, of being ready for use simply by diluting them according to directions.

III. Carbolic Acid. (Phenol.)

The term " carbolic acid " has been rather loosely applied to a variety of substances which, though related chemically, are yet quite different in their disinfecting properties. The true carbolic acid or phenol, when in a pure state, is solid at ordinary temperatures and when freed of water crystallizes in long white needles. Owing to their property of absorbing water from the air the crystals are likely to form a solid cake in bottles or other containers. For this reason carbolic acid is usually dispensed from drug stores in a liquid form by adding one part water to nine parts of the crystals.

This pure carbolic acid is not a satisfactory general disinfectant for farm buildings, first, because of its high cost; second, because it is not so effective as some of the cheaper disinfectants, and third, it is corrosive in its action.

For application to large surfaces it should be used in a strength of 5 per cent. The same strength is used for disinfecting sputum or discharges from the sick room. The amount of disinfectant added to such materials should equal the bulk of the substance to be disinfected and be well stirred in.

Fabrics may be disinfected by immersion in a 5 per cent. solution for one hour.

Note.—*Carbolic acid is a strong poison and thus is dangerous to leave unprotected around the house.* In case of poisoning give Epsom salts in abundance and soap.

IV. Crude Carbolic Acid.

Crude carbolic acid is a dark, oily fluid obtained in the distillation of coal tar. It is a mixture of oils and "tar acids" or cresylic acid. The oils present have no disinfecting power—the active principle being tar acids.

The percentage of tar acid in commercial crude carbolic acid varies considerably; therefore, when using crude carbolic acid as a disinfectant it is necessary to know the percentage of tar acid, or cresylic acid, present so that a proper strength can be established. Enough water should be added to produce a 2 per cent. solution of tar acid. Thus, crude carbolic acid containing 50 per cent. tar acid should be diluted by adding 50 parts of water to 1 part of the crude carbolic acid.

Thorough stirring is necessary to bring about complete solution of the tar acid. The oils are insoluble and will float when mixed with water.

The disinfecting solution prepared in this way is best applied with a spray pump. During the spraying the solution should be agitated so as to effect an even distribution of the oils, which always contain undissolved tar acids. Like pure carbolic acid, it is somewhat corrosive.

V. Cresol.

Cresol is found on the market under a variety of names such as tricresol, cresylic acid, liquid carbolic acid and straw-coloured carbolic acid. It is a clear, oily liquid, and varies in color from light straw to a deep reddish brown. It has a strong odor somewhat resembling that of pure carbolic acid.

The commercial article consists of a mixture of closely related bodies, all of which are superior to pure carbolic acid as disinfectants. It differs from "crude carbolic acid" in being practically free from coal-tar oils.

Commercial grades usually contain from 90 to 98 per cent. of cresylic acid or tar acids.

Under ordinary market conditions cresol is relatively cheap and is well suited to the disinfection of stables, barns, cars, stock wagons, etc. Roughly, a 2 per cent. solution of cresol is as effective as a 5 per cent. solution of pure carbolic acid.

Cresol is not readily soluble in cold water, so warm water should be used and care should be taken to see that all cresol is dissolved before the disinfectant is used.

Cresol is poisonous though not so much so as pure carbolic acid.

VI. Compound Solution of Cresol.

As above stated, cresol is not readily soluble in water, therefore, compounds of cresol with soap, which are readily soluble in water, are better for general use in stable disinfection.

Compound solution of cresol (liquor cresolis compositus) is a mixture of cresol with a soap made of linseed oil and potash or soda. It is a thick, clear, dark brown fluid which mixes readily with soft or distilled water in all proportions to form a clear, soapy solution. It does not mix well with hard water because the mineral salts in the hard water cause the soap to break up and separate in sticky masses.

A satisfactory substitute for the compound solution of cresol may be made by mixing cresol of full strength (90 per cent. cresylic acid) with green soap, equal parts of each by weight being used. The cresol is warmed and the soap stirred in until completely dissolved. Green soap may be bought at the drug store.

Compound solutions of cresol are used in 2 to 3 per cent. solutions in soft water as effective spray disinfectants for stables, barns, cattle cars, etc.

There are various cresol compounds on the market under various trade names as Creolin, Lysol, Solveol, Solutol, etc. These are very similar in composition to the liquid cresolis compositous and are effective disinfectants when used in from 2-3 per cent. solution in soft water.

VII. Emulsified Coal-tar Disinfectants.

Such commercial disinfectants as Zenoleum, Germol, Disinfectall, Carboleum, Kresol, International Dip, Car-Sul-Dip, Daytholeum, etc., are widely advertised and much used. In general, they all contain coal-tar products, belonging to the phenol and cresol groups, to which they owe their active properties.

In general appearance they are very similar and their odors are nearly alike. Some appear heavier and thicker than others. They mix with water in all proportions forming an emulsion which is more or less milky in appearance. They are non-corrosive. On account of these properties they are preferable in many ways to crude carbolic acid.

Used as spray disinfectants for stables, etc., they are very effective in 2-3 per cent. solutions in water. They should be kept well stirred up when being applied.

VIII. Formaldehyde.

Formaldehyde, which is a gas, is not of much use as a stable, barn or outhouse disinfectant, but it is one of the very best disinfectants for use in the house or in rooms that can be tightly closed up.

Formaldehyde is sold in two forms; formalin, which is a 40 per cent. solution of formaldehyde gas in water, and paraformaldehyde, a solid white substance made into tablets, cakes or candles. Both the solution and the solid form must be kept tightly closed until ready for use, or they will evaporate in the gaseous form.

Formaldehyde gas is very irritating to the eyes and throat, hence care should be taken not to inhale it. It will also cause the skin to peel off after a few days from time of contact. It is non-corrosive and does not injure pictures, clothing or even the most delicate fabrics.

Formaldehyde may be used as a disinfectant either in the liquid or gaseous form. In the former case formalin (40 per cent. formaldehyde) is mixed with water in the proportion of 6 ounces to the gallon, and the resulting solution is applied directly to surfaces or substances to be disinfected.

Where it is to be used as a gas the room to be disinfected must be tightly closed, all crevices, window joints, door joints, keyholes, etc., being sealed up tightly. Bedding, carpets and clothes should be hung loosely in the room so that the gas may readily penetrate them. Warmth and the moisture in the room favor its action.

Various methods of generating the gas are practised. One of the simplest and most effective is by the use of formalin with potassium permanganate as follows:

Potassium Permanganate Method of Generating Formaldehyde Gas.

For every 1,000 cubic feet of space in a room, 20 ounces of formalin and 16 2-3 ounces of crystallized or powdered permanganate of potash will be needed.

Place the permanganate of potash in a wide-topped paper pail and stand the pail in a large pan of water in the middle of the floor. Remove from around it anything that is inflammable. Then pour the 20 ounces of formalin over the permanganate of potash. A violent chemical reaction will take place with bubbling and frothing and heat. The room should be immediately closed and left shut up for 12 hours or longer.

Sprayed Sheet Method.

Hang several sheets on cords stretched from wall to wall in the room. Spray or sprinkle these with undiluted formalin at the rate of not less than 10 ounces of formalin per 1,000 cubic feet. One sheet will take about 5 ounces without dripping. The formalin may be sprayed on with an atomizer such as used for spraying cows or may be sprinkled on with a whisk. The drops should not run together on the sheet and there should be no drip. As soon as the sprinkling is completed the door should be shut and the room kept tightly closed for at least 12 hours.

For this method of application it is essential that the room be warm. The inside temperature should not be lower than 65°F.

Paraformaldehyde Method.

Paraformaldehyde (solidified formaldehyde) for disinfection purposes is usually sold as candles, cakes or tablets. Formaldehyde gas is generated from these by the application of heat. Usually cheap lamps or specially prepared candles are sold in connection with these preparations for the purpose of supplying the necessary heat. On the application of the necessary heat, the paraformaldehyde melts and then evaporates as a gas. It Catches fire rather easily and burns with a blue flame. When this occurs its disinfecting power is lost. This method can be recommended only for small rooms, closets, etc., which should be kept tightly closed for 12-24 hours after treatment.

IX. BICHLORIDE OF MERCURY. (Corrosive Sublimate.)

Bichloride of mercury is a powerful disinfectant, but *it is also a very strong poison,* and is corrosive in its action on metals. When used in a strength of 1 to 1,000 it is a useful disinfectant for washing the hands, swabbing down tables and floors, but when added to albuminous materials, such as blood or excreta, it unites with these forming inert compounds and thus loses its disinfectant power.

It is usually sold in form of tablets in which it is combined with ammonium chloride or sodium chloride. These tablets are readily dissolved in water.

It is not recommended for general use about the farm or house, chiefly because of its poisonous character.

(*In case of mercuric chloride poisoning the white of eggs and milk should be given in abundance*).